REMARKS

Claims 1 through 8 are pending in this application.

Claim Objection under 35 U.S.C. § 112

Claim 6 was rejected under the second paragraph of 35 U.S.C. § 112 for indefiniteness. The applicant Lee thanks the Examiner for pointing out the difficulty with this claim, as presented. To overcome the claim objection stated at paragraph 5 beginning on p. 2 of the office action, Lee has amended the claim to remove the eighth means which the Examiner found duplicative in part of the fourth means. In addition, Lee has inserted after the seventh means a statement based on the language at line 4, p. 12, of the specification, namely "whereby the data writing process is completed." Lee believes that this amendment responds fully to the point that the Examiner raised, and that therefore the § 112 rejection should be withdrawn.

Claim Rejection Under 35 U.S.C. § 102

Claims 1, 2, and 6 through 8 were rejected under 35 U.S.C. § 102(e) for alleged anticipation by Jones U.S. Patent No. 5,572,660. As stated by the Federal Circuit many times, anticipation can occur only if the single cited reference discloses all elements of the claimed invention arranged in the same manner, relative to one another, as they are arranged in the claimed invention. *C.R. Bard, Inc. v. M3 Sys., Inc.*, 157 F.3d 1340, 48 U.S.P.Q.2d 1225 (Fed. Cir. 1998), and cases cited therein.

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Jones does not disclose the one-to-one caching of Lee's invention, which adapts one-to-one caching for RAID 5 systems. (As amended, all claims are now limited to RAID 5.) The Examiner cited the Abstract of Jones, which says, "Each data drive is associated with a dedicated write-through cache and the parity drive is associated with a dedicated write-back cache unit." This point is amplified in the Summary of the Invention, col. 2:62 to col. 3:63, where Jones explains:

> In one embodiment, a fault tolerant disk array subsystem implements a level 4 RAID technique and includes a plurality of data drives for storing real data and a parity drive for storing parity information. Each data drive is associated with a dedicated write-through cache unit and the parity drive is associated with a dedicated write-back cache unit.

Jones explained earlier that a need exists to eliminate a disadvantage of RAID 4 relative to RAID 5, which is more expensive and has better throughput than RAID 4. Jones seeks to improve RAID 4 in this regard, while maintaining RAID 4's "advantages of data redundancy and low cost" (col. 2:34-58). Jones does not try to use the dedicated cache concept to which the Examiner refers in the office action, when Jones implements RAID 5; this, is shown by the Examiner's discussion of Fig. 2D on p. 7 of the office action. This because it was established practice under RAD 5 to distribute caching among several caches. Thus Jones states (col. 10:15-18):

> ...FIG. 2D is a functional block diagram of a computer system 250 including a disk array subsystem 252 which implements the level 5 RAID approach. Circuit blocks that correspond to those of FIG. 2 are numbered identically.
> The embodiment of FIG. 2D is similar to that of FIG. 2 with the exception that the parity information is stored and distributed among the plurality of

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disk drives 214-1 through 214-8 according to a level 5 RAID approach.

Jones confirms here that one-to-one caching was not used in the prior art for RAID 5 and that Jones does not use it, either, in RAID 5. The reason is that the present invention first provided a means for having the benefit of RAID 5 with one-to-one caching.

As now amended, the claims more clearly point out that the invention is directed to a problem that Lee found in the prior art RAID 5 systems. Thus at p. 6 of the specification, Lee stated:

> However, when writing instruction of a short data block is received from the host computer in the RAID structure of 5 level, access of another disk on the strip is brought about which attributes to a deterioration of the entire system performance. I have observed that this phenomenon remarkably appears in the on-line transaction processing environment having many operation loads. That is, in case of the partial strip writing, old parity and old data are read from a predetermined drive, exclusive-OR operation is performed to determine new data, and then new parity information and new data are written in the predetermined drive. Two-time reading and writing operations are necessarily required which results in a larger overhead of data write in comparison with a single large expensive drive.

Therefore, the amended claim limitation restricting the claims to RAID 5 systems prevents Jones from anticipating the instant invention.[1]

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[1] Anticipation of a claim under 35 U.S.C. § 102(b) can occur only if each and every element and limitation of the claim is found in a single prior art reference. *In re Robertson*, 169 F.3d 743, 49 USPQ2d 1949 (Fed. Cir. 1999); *In re Schreiber*, 128 F.3d 1473, 44 USPQ2d 1429 (Fed. Cir. 1997); *Gechter v. Davidson*, 116 F.3d 1454, 43 USPQ2d 1030 (Fed. Cir. 1997). If a single element or limitation is missing from the reference, no anticipation occurs. *Motorola, Inc. v. Interdigital Technology Corp.*, 121 F.3d 1461, 43 USPQ2d 1481 (Fed. Cir. 1997); *Kloster Speedsteel AB v. Crucible, Inc.*, 793 F.2d 1565, 230 USPQ 82 (Fed. Cir. 1986).

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Claim Rejection Under 35 U.S.C. § 103

Claims 3 through 5 were rejected under 35 U.S.C. § 103(a) for alleged obviousness over Jones in view of Holland *et al.* U.S. Patent No. 5,455,934. However, Holland, like Jones, does not disclose a system for one-to-one caching in RAID 5. Therefore, an important element of the instant invention is missing from the combination of Jones and Holland. But when an invention is alleged to be obvious from a combination of references, the combination must disclose *all of the elements* of the invention. No claim limitation can be ignored in making a patentability analysis under § 102 or under § 103. *In re Lowry*, 32 F.3d 1579, 1582, 32 U.S.P.Q.2d 1031 (Fed. Cir. 1994)("The PTO must consider all claim limitations when determining the patentability of an invention over the prior art.").[2]

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[2] In *Al-Site Corp. v. VSI Int'l*, 174 F.3d 1308, 1324, 50 U.S.P.Q.2d 1161 (Fed. Cir. 1999), the Federal Circuit held that a claim was not shown to be obvious from the Seaver patent. The reason was that "although the Seaver patent discloses some of the elements recited in the Magnivision patents' claims, it does not disclose the display member, the cantilevered support, or the aperture for mounting the hanger tag on the cantilevered support," and the art of record did not suggest adding those elements to Seaver. Similarly, the Federal Circuit rejected a challenge against an obviousness determination where the cited art *did* contain all elements of the invention. *In re Schreiber*, 128 F.3d 1473, 1479, 44 U.S.P.Q.2d 1429 (Fed. Cir. 1997)("Schreiber argues that the combination of Harz and Fisher does not disclose all the limitations of claim 2 because neither Harz nor Fisher discloses the functionally defined features of the top. That argument is without merit because, as we have already noted, Harz discloses those functionally defined limitations.").

See also *In re Gartside*, 203 F.3d 1305, 53 USPQ2d 1769 (Fed. Cir. 2000)("We agree with the Commissioner that substantial evidence supports the Board's factfinding and that the Board correctly concluded that the claims were unpatentable under § 103. As an initial matter, we agree with the Commissioner that substantial evidence supports the Board's finding that Gartside's '645 and '235 patents *contain all the limitations set forth* in claim 47."); *Mitsubishi Electric Corp. v. Ampex Corp.*, 190 F.3d 1300, 1313, 51 U.S.P.Q.2d 1910 (Fed. Cir. 1999)(upholding § 103 determination because "a reasonable jury could have concluded that the second Williard article in combination with either the first Williard

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Although failure of the combined references to meet all limitations of the independent claims by itself requires withdrawal of the rejections and moots all other issues, Lee notes for the record that there are no findings of a specific motivation, teaching, or suggestion in the prior art to adapt and modify Jones' device to incorporate Holland's device or to adapt Holland's device so that it could be incorporated into Jones's device, and thereby arrive at Lee's invention. *In re Dembiczak*, 175 F.3d 994, 50 U.S.P.Q.2d 1614 (Fed. Cir. 1999); *In re Rouffet*, 149 F.3d 1350, 1359, 47 U.S.P.Q.2d 1453, 1459 (Fed. Cir. 1998). See also *ATD Corp. v. Lydall, Inc.*, 159 F.3d 534, 546, 48 U.S.P.Q.2d 1321 (Fed. Cir. 1998) ("There must be a teaching or suggestion within the prior art, or within the general knowledge of a person of ordinary skill in the field of the invention, to look to particular sources of information, to select particular elements, and to combine them in the way they were combined by the inventor."). In addition, there are no evidence-backed findings of the ordinary level of skill in the pertinent art made of record. Thus the *Dembiczak* decision held that an obviousness rejection must be reversed if, like the instant rejection, it fails to contain "specific findings of fact regarding the level of ordinary skill in the art." 175 F.3d at 1000-01, 50 USPQ2d at 1618. In addition, the
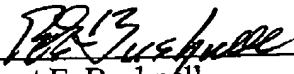
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article or the Goode and Phillips article provided all of the elements of the claimed invention"); *In re Rouffet*, 149 F.3d 1350, 1357, 47 U.S.P.Q.2d 1453 (Fed. Cir. 1998)(court stated that it would uphold the part of the Board's § 103 ruling on the point that the three cited references contained all of the claimed elements: "the Board did not err in finding that the combination of King, Rosen, and Ruddy contains all of the elements claimed in Rouffet's application").

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findings that the PTO makes on the ordinary level of skill must be supported by sub-

stantial evidence of record. *In re Kaplan*, 789 F.2d 1574, 1580, 229 USPQ 678, 683 (Fed.

Cir. 1986) ("Even if obviousness of the variation is predicated on the level of skill in the

art, prior art evidence is needed to show what that level of skill was."). As to method

claims 7-8, Lee notes for the record that 35 U.S.C. § 100(b) provides that he is entitled to

a new use claim even if, contrary to fact in this case, the new use is a new use of an old

structure or method.

In view of the above, it is submitted that the claims of this application are in

condition for allowance, and early issuance thereof is solicited. Should any questions

remain unresolved, the Examiner is requested to telephone Lee's attorney.

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MARKED-UP VERSION OF AMENDMENTS MADE

IN THE CLAIMS

Please amend claims 1, and 6 through 8, as follows:

1   1 (five times amended). A <u>redundant array of inexpensive disks (RAID) level 5</u>

2   memory system, comprising:

3   a plurality of defect-adaptive memory devices, each of said plurality of defect-adaptive

4   memory devices having a first region for sequentially storing parity information

5   for data recovery and a second region for storing data;

6   a plurality of caches, each of said plurality of caches respectively coupled operatively to a

7   corresponding <u>single</u> unique one of said plurality of defect-adaptive memory

8   devices, each of said plurality of caches adapted for storing parity information for

9   data recovery for a corresponding <u>single</u> unique one of said plurality of defect-

10   adaptive memory devices <u>to provide one-to-one caching</u>; and

11   a controller operatively coupled to each defect-adaptive memory device of said plurality

12   of defect-adaptive memory devices and to each corresponding <u>single unique</u> cache

13   of said plurality of caches, said controller comprising a first means for selectively

14   controlling writing and reading of parity information needed for data recovery in

15   said first region of each corresponding <u>single unique</u> one of said plurality of

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16 defect-adaptive memory devices, a second means for selectively obtaining parity

17 information needed for data recovery from said first region of each corresponding

18 single unique one of said plurality of defect-adaptive memory devices, and a third

19 means for selectively storing parity information needed for data recovery obtained

20 from said first region of a corresponding single unique one of said plurality of

21 defect-adaptive memory devices in a predetermined corresponding single unique

22 one of said plurality of caches.

1 6 (five times amended). A redundant array of inexpensive disks (RAID) level 5

2 system, comprising:

3 a plurality of disk drives, each of said plurality of disk drives including a first region

4 having a plurality of data blocks for storing data and a second region having a

5 predetermined number of parity blocks for storing parity information for data

6 recovery;

7 a plurality of caches, each of said plurality of caches respectively coupled operatively to a

8 corresponding single unique one of said plurality of disk drives, each of said

9 caches adapted for storing parity information for data recovery; and

10 a controller adapted to provide one-to-one caching, said controller operatively coupled to

11 each disk drive of said plurality of disk drives and to each corresponding single

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12   unique cache of said plurality of caches, said controller adapted for selectively

13   controlling a write operation of data and parity information for a data recovery in

14   each corresponding disk drive of said plurality of disk drives, said controller

15   comprising:

16   a first means for selecting a single predetermined disk drive of said plurality

17   of disk drives upon receipt of a data writing instruction from a host

18   computer;

19   a second means for reading old data from the single predetermined disk

20   drive of said plurality of disk drives;

21   a third means for determining whether old parity information corresponding

22   to the old data corresponding to the single predetermined disk drive

23   of said plurality of disk drives is accessed in a corresponding single

24   unique cache of said plurality of caches;

25   a fourth means for reading the old parity information from the single pre-

26   determined disk drive of said plurality of disk drives, upon the old

27   parity information corresponding to the single predetermined disk

28   drive of said plurality of disk drives not being accessed in the

29   corresponding single unique cache of said plurality of caches, and for

30   then loading the corresponding single unique cache of said plurality

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31   of caches with the old parity information;

32   a fifth means for obtaining new parity information by performing an

33   exclusive OR operation on the old data, the old parity information

34   and new data;

35   a sixth means for loading the corresponding single unique cache of said

36   plurality of caches with the new parity information; and

37   a seventh means for writing the new data in said region for storing data in

38   the single predetermined disk drive of said plurality of disk drives

39   and writing the new parity information in said another region for

40   storing parity information in the predetermined single disk drive of

41   said plurality of disk drives. [; and]

42   [an eighth means for reading old parity information from the single pre-

43   determined disk drive after the seventh means has written new data

44   in said region for storing data and has written the new parity infor-

45   mation in said another region for storing parity information, in the

46   event that no old parity information exists in a corresponding cache,

47   and for then moving said old parity information read from the single

48   predetermined disk drive to the corresponding cache to provide an

49   update of the parity information.]

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50 whereby the data writing process is completed.

1 7 (amended). In a method of writing data to, and reading data from, a redundant

2 array of inexpensive disks (RAID) level 5 system, said method comprising steps for se-

3 quentially storing information for data recovery in a first region of a disk, storing

4 information comprising data in a second region of the disk other than the first region,

5 controlling writing and reading of information by means of an electronic controller unit,

6 and caching information for data recovery, *the improvement comprising* a step for

7 reducing overhead during a read operation for data recovery and thereby improving data

8 input-output performance.

1 8 (amended). The method of claim 7, wherein said step for reducing overhead dur-

2 ing a read operation for data recovery and thereby improving data input-output perfor-

3 mance comprises steps for:

4 (a) coupling each one of a plurality of caches to each corresponding one of a

5 plurality of disks, whereby each disk is coupled one-to-one to one cache;

6 (b) operatively coupling the caches to the controller;

7 (c) storing in each one of the plurality of caches information for data recovery in

8 the disk corresponding to the cache; and

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9   (d) determining information for data recovery in a disk by using information for

10   data recovery stored in the cache corresponding to the disk.

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